Title: High-average power picosecond mid-IR source

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Abstract: High average power wavelength tunable picosecond mid-IR source based on optical parametric generation (OPG) and optical parametric amplification (OPA) is being developed. The conversion system is pumped by an Yb:YAG thin-disk laser delivering 100 W of average power at 100 kHz repetition rate, 1030 nm wavelength, and 2-3 ps pulse width. Part of this fundamental beam pumps an OPG process in a PPLN crystal. The generated wavelength is determined by PPLN's poling period and temperature. Tunability of the signal wavelength between 1.46 μm and 1.95 μm was achieved, the signal beam of 20 mW was generated at 2 W of pump power, when double pass of the beams through PPLN crystal was used. The corresponding idler wavelengths were in range 2.18-3.50 μm. The signal beam was further amplified by OPA process in two KTP crystals, which was pumped by the fundamental beam. The signal beam was amplified up to 2 W at pumping of 38 W. Tuning of the output wavelength was realized by change of the phase-matching angle in KTP crystals. Tunability between 1.70-1.95 μm for signal and 2.18-2.62 μm for idler was achieved by this way. Improvements of the system for achievement of higher output powers and broader range of tunability were proposed.

Keywords: Infrared lasers, mid-IR, optical parametric generation, optical parametric amplification, thin-disk lasers